

The expression of target HSP70 gene and membrane stability determine heat tolerance in chili pepper

ABSTRACT

Experiments were carried out to study the mechanisms for heat tolerance in chili pepper (*Capsicum annuum*). To assess these mechanisms, six genotypes were evaluated for cellular membrane thermostability (CMT) and for HSP70 gene expression. The plants were grown in an experimental plant growth chamber. The mean value of CMT indicates that membrane integrity was not damaged by the high temperature treatment (50 °C) in most of the genotypes. The genotypes were classified as follows: heat-tolerant (greater than 60%), moderately tolerant (30% to 60%), and susceptible (less than 30%). The heat-tolerant plants recorded the highest CMTs at 89.27%, 88.03%, and 85.10% for AVPP0702, AVPP0116, and AVPP9905, respectively, which might be the reason for the change in their cell membrane thermostability. AVPP9703 and AVPP0002 showed CMTs of 15.87% and 18.43%, which might indicate their sensitivity to heat stress. Heat shock protein 70 kDa was identified and found to be differentially expressed under the heat stress. Under heat stress, significantly increased levels of the HSP70 gene were detected after 2 h of temperature treatment at 42 °C, which indicated that this gene is quickly and sharply induced by heat shock. This was true for all genotypes tested, which were significantly up-regulated by more than 36.9-, 7.10-, 3.87-, and 3-fold for AVPP0702, AVPP0116, AVPP0002, and AVPP9703, respectively. The HSP70 gene was found to be significantly down-regulated under heat stress in AVPP0702, AVPP9905, and AVPP0116 could be considered as heat-tolerant genotypes, whereas AVPP9703 and AVPP0002 were found to be heat-sensitive genotypes in this investigation.

Keyword: *Capsicum annuum*; Stress-responsive protein; Electrolyte leakage; Heat stress; Thermal tolerance